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EXHAUST

". . . a dagger pointing at the heart of Berlin . . .

IN the past few weeks World War II flared into greater activity on every major front around the world.

The entry of the long awaited Allied armies of liberation into the ancient fields and towns of Normandy unsheathed the dagger so carefully forged over many long months.

That dagger is cutting deeply and being wielded with skill and courage.

The public press has estimated its strength in terms of the numbers of men and machines. The Allied High Command planned the strength of this dagger in much finer detail.

Into its making is calculated every known and anticipated quantity. Yet there must be undefined factors, of which the primary one is the effectiveness of enemy counter-measures—his ability to inflict casualties on personnel and machines. Even this can be estimated. But there is another form of casualty that must be taken into account—a machine's loss of efficiency, either partial or total. This too is calculated into the master plan.

These logistics are based on a yardstick marked off with the knowledge and skill with which the equipment will be operated and the quality of maintenance they will receive. For upon these factors depend an army's speed of movement, mobility and firepower.

As the battle mounts, the factor of maintenance and repair becomes greater. Our ability to keep every available piece of equipment in action at its highest efficiency may easily mean the difference between advance or stalemate. We have the equipment—the dagger has been well made, but the finest steel becomes dulled and nicked with violent use, unless it is maintained with knowledge and care.

The power of our guns, the extent of our mobility and the soldier's very life is affected for better or worse, in direct proportion to the energy with which maintenance is learned and carried out in training and in combat.

Maintenance is our job—maintenance to keep the dagger sharp.

CAM

JULY – 1944

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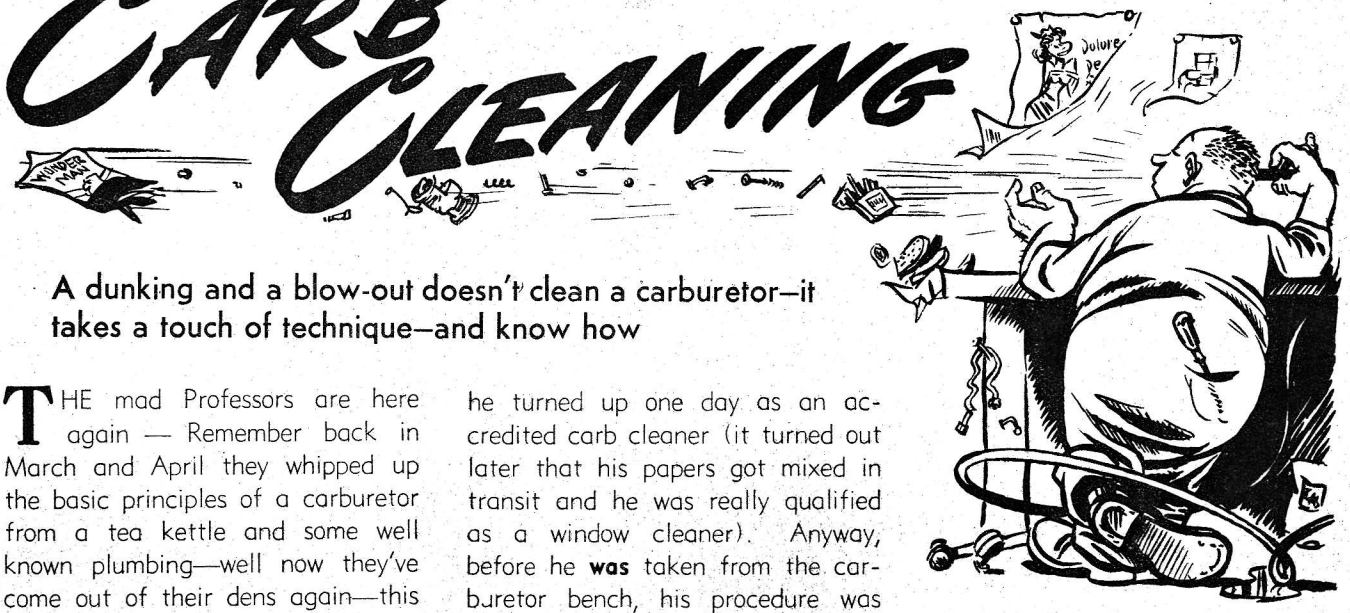
CARB CLEANING



A dunking and a blow-out doesn't clean a carburetor—it takes a touch of technique—and know how

THE mad Professors are here again — Remember back in March and April they whipped up the basic principles of a carburetor from a tea kettle and some well known plumbing—well now they've come out of their dens again—this time to slip us the script on carburetor cleaning procedure.

Now we realize that taking carburetors apart, cleaning all the bits and pieces and getting them back together again in correct adjustment, is not everybodys meat. In fact to some of you it may be poison from the personal and the carburetor's angle. In which case—leave 'em be. But to those "qualified" King's men who the sergeant is wont to toss a carb at with explicit instructions to give it a going over—we have a story to relate. We venture to suggest that even qualified carb cleaners might pick up a pointer or two while reading this over their second helping of roast duck and caviar in the mess.

As our March and April articles implied, the **principles** of carburation are standard but different manufacturers go about applying these principles in different ways. The basic principles of **cleaning** carburetors are also about the same—but a sound know-how' on the particular make you are working on helps when it comes to taking them apart and putting them together again.

Take Pte. Philo Fuddle for instance —and the sarge would be pleased no end if you did—somehow or other he turned up one day as an accredited carb cleaner (it turned out later that his papers got mixed in transit and he was really qualified as a window cleaner). Anyway, before he **was** taken from the carburetor bench, his procedure was something like this—and don't think that he thought it up himself—not our Philo—he'd watched **other** so called carburetor experts at work. First he takes his trusty (and only) screwdriver and takes apart every screw, jet and fitting that looks like it will move. Next he swishes all these bits in some dirty Varsol. That it had been used to wash everything in the shop from transfer cases to the Sarge's coveralls was a mere incidental to our Philo. Now that all the parts are clean (?)—well, lets say wet anyway—our friend proceeds to blow everything out with compressed air. All well and good—but what's that coming out the air hose —water vapour by the look of it. But, we learn, it isn't the duty of one, Pte. Philo Fuddle, to drain the compressor so if it squirts water as well as air into the carb parts—well it's just one of those things.

Now came the putting together operation—at the same time we reached the point where we couldn't bear to look anymore.

The next thing we know the carburetor is back on the vehicle—and Philo is happy (and secretly relieved) to note that the vehicle will run.

Of course it was a bit dirtier than it was before, the engine didn't seem to idle very well and time would show that the vehicle was now travelling 11 miles on every gallon instead of its former 14—but Pte. P. Fuddle was pleased—**he'd** done **his** job and was all set to go to work on the next carburetor.

But at this point he found himself snatched up and held with his nose within .005" of a rapidly turning grinding wheel while the Prof came across with the right procedure.

First of all, explained his nibs, he was right in deciding to disassemble the carburetor—but there is a proper method of doing this—like using the correct tools. Many a good carburetor part has met its Waterloo from wrong tools in ham hands. Like using the proper size screwdriver for example. Several different sizes should be on hand before tackling a carb job and these should be in good shape—properly ground and without burred and rounded corners *(see CAM of Jan. Page 50.—Ed.)*

Sometimes a brass plug or jet in a carburetor will be very tight and difficult to budge. If brute force and ignorance is used on the screwdriver to loosen it the slot will prob-

ably suffer. In a case like this, tap the handle of the screwdriver smartly —**but lightly** with a small hammer. This will usually loosen the threads so that the plug will screw out easily.

As each part is removed run your eye over them for signs of wear or damage—where that does show up put them tc one side ready to return to salvage when new parts are obtained.

Dirt and Gum are the root of most evil in carburetors.

Dirt is the easier of the two to eliminate by observing strict cleanliness while working on them. Use clean Varsol, and clean tools on a clean bench.

Gum is a horse of a different hue — and often overlooked by careless carb cleaners because it forms in the inside channels and surfaces of the carburetor where it can't be seen—and there it will stay unless it is chased out by a more pursuasive method. Varsol—clean or dirty—won't remove gum so you use a gum solvent called Gunk H.S.*—available through Spare Parts—and soak the carburetor in it for at least fifteen minutes. This will dissolve the gum so that it will wash away when the parts are given a final rinse in clean Varsol.

Which brings up an important point. Some parts should **not** be soaked in the cleaner or they will be damaged. So before you dunk the works make sure that the accelerator pump piston leather, fibre disk check valves, rubber parts, cloth diaphragm valves and all gaskets are kept safely high and dry in a clean spot.

Now you are ready to blow out the parts with air pressure—and here is where, if you're not careful and fully conscious, a spot of bother can crop up. If the air line has water in it —and they often have, due to condensation in the tank—don't direct the first damp and damaging breeze onto the carburetor part. Blow off the water first.

In the next scene you are holding a teensy weensy jet gracefully between finger and thumb and then direct a 150 lb blast of air at it. Exit the jet. It's important to blow out all the channels in the carburetor and the jets too—but hang on to them while you're doing it—and use discretion with the air blast. Some carburetors (like Zenith) have a small disc type filter incorporated in the bowl. When giving this type of strainer a blowout, the air must be directed so that it will blow from the inside to the outside. Too much air pressure will damage the thin discs—so keep the nozzle of the air hose at a safe distance from the filter element. The accelerating pump piston leather will also take a beating from an over dose of air pressure—watch it too.

With the parts now cleaned and ready for reassembling, comes the final touch that can make or break the whole job.

As the Prof asked Pte. Fuddle, when you wash your shirt and rinse it out in clear clean water so that there isn't even a trace of tattletale grey do you then toss it on the road or a dirty floor to dry? No? Yet carb parts, fresh from the cleaning process, are tossed on a dirty work bench—or floor, and handled with grease, grime and grit covered hands. It doesn't make sense—but it's done.

The thing to do, of course, is keep them on a clean tray, or, if you're fresh out of trays, a clean sheet of paper. The idea being to keep 'em clean once you've got them that way.

The reassembling, checking and adjusting of the various makes is a longer story which space forbids at the moment. But the simple job of cleaning the bits and pieces is where some of the "experts" slip up.

From then on they just develop worry warts between their ears trying to adjust them—because dirt and gum plugged carburetors can't be cured by adjusting.

So, when you **do** clean 'em—clear 'em right.

x y z

Now who the sammill is Citengam Gulp? Well don't lie awake nights trying to figure it out cause we'll tell you. If you spell it backwards you'll have Magnetic Plug and it's the drain plug that's in oil pans, transmission cases and differential cases. As the kid with the magnetic personality it's the most attractinest little jigger you ever saw—but of course that's what it's there for. Any little particles of metal, old screwdrivers or pliers that somehow get into the oil or grease are prevented from floating around and getting into the bearings and gears by the attraction of said plug. It's a swell idea and they'll do a swell job 'til they gather up so much stuff they can't hold anymore. After they get covered with a certain amount of metal particles along with dirt and muck they just sit down and wait for you to clean 'em before they'll do any more work.

Everytime you have these drain plugs out, don't be in such a hurry to get back to the picture of your Sarge that you have hanging beside your bunk. Anyway, take enough time to clean off the plug nice and slick so it'll have a chance to do more pickin' up for you.

* *Gunk Hydro Sealed Carbon gum digestant Spare part No. 90367*

..GIVE ME AIR!

HOW'D you like to pump a few 12.00 x 20's by hand same time when you hadn't taken P.T. for weeks, or handn't eaten for days, or when you were standing on your head?

Silly question—ain't it? You know very well what the answer is. It's hard to picture yourself in a spot like that, yet lots of air compressors in workshops are gasping for breath because they're getting the same kind of treatment.

While an air compressor isn't human and it doesn't need callisthenics to keep it in shape, it does need its own brand of vitamins and special care if you expect it to be Johnny-on-the-spot.

The electrically operated air compressor that's in your shop, whether it's small or large size, it's probably the handiest and most overworked piece of equipment you use. It's the baby you rely on everytime there's a tire to be pumped, a paint job to be done or a carburetor to be cleaned. Go ahead—run the thing without oil, don't bother to drain off the water, let the pipes leak so it will be pumping all the time. Go ahead—but someday that compressor's going to heave one big sigh and lay down and die. Then you'll be sorry.

There are certain things that should be done every morning before you switch the compressor on—what's more, they're just as important as the daily C.P.M.S. a driver gives his vehicle.

But don't get all excited about this daily check-up it's only going to take a coupla minutes to make everything ship-shape. Read on McDuff and you'll see just how simple it is.

The lil' old air compressor must be kept clean—so first thing you do is wipe it off all over with a **dry** cloth. Next—check the oil level in the air pump—if the level is low, add fresh oil to bring it up to its proper level. Use D.N.D. 345 in the winter and D.N.D. 365 in the summer.

Any guy that's really on the ball will take care not to spill oil or grease on the rubber airlines but if any does get on them they should be washed off with soap and water—uh uh—don't use gasoline, varsol or stale beer. Gasoline is dangerous, varsol does the rubber no good—and there's a serious shortage of the latter (the rubber we mean).

Another daily job—and an important one too—is draining the water from the tank. Moisture from the air collects during the day and settles in the bottom of the tank. If the water is not drained off every day you'll be pumping a heavy fog into your tires but what's worse. (next to having water on the brain) is having water in the line when using the air pressure for spray painting or spark plug cleaners etc. Also the more water that lies in the tank the less space there is for the air—result—overworked and inefficient compressor.

Every compressor has a filter muffler of some type to keep dirt, grit vermin and stuff out of the cylinder. The cleaning of the filter then is another check-every-day item, because if the filter gets dirty and clogged up it's, well, how'd you like to run a mile with a plugged respirator on. We know that you'll agree with us when we say the compressor has a big enough job to do without expecting it to act as an air conditioning unit for the shop—but that's exactly what it does when

DAILY AND SEMI-MONTHLY
AIR COMPRESSOR CHECK CARD

DAILY CHECK
To be initialed each day by NCO in charge

TASK DATE.....																			
CLEANED?																			
CORRECT OIL LEVEL IN AIR PUMP?																			
FILTER MUFFLER NOT CLOGGED?																			
AIR LINES & CHUCK NOT LEAKING?																			
RUBBER AIR LINES CLEAN?																			
WATER DRAINED FROM TANK?																			

Semi-monthly check Date.....

TASK	OK'D	REMARKS
OIL CHANGED? Summer DND 365 Winter DND 345		
VALVE CLEARANCE? .010"to.015"		
BELT TENSION? ½" deflection		
MOTOR OILED? 4 or 5 drops		
MOTOR BRUSHES?		
TEST SAFETY VALVES?		

SIGNED.....(NCO in Charge)

This is the form we suggest on page 164— to be hung up near the compressor

there are leaky air lines all over the place. All air lines and connections should be checked everyday—but naturally this check has to be made with the compressor in operation. A little soapy water on the connections will tell you if they're leaking or not —or you can use oil on metal pipe joints.

Twice a month (and that's what the Canadian Army Local E.M.E. Instructions for workshops say on number B 910 CA) the air compressor should be given a thorough check up. In this operation it should get some fresh vitamins, by this we mean an oil change. Just drain off the old oil and re-fill with fresh oil of the correct grade.

Now just in case you happen to have a screwdriver in one hand and time on both you shouldn't tinker around with the compressor but there are a few points you should check twice a month and adjust them if necessary. Check the clearance between the unloading valves and the rocker arm adjusting screws,—it should be between .010" and .015" Also on the "Do Not Play Around With" list is the safety valve. However, at least twice a month the saftey valve should be tested by pulling up the tip that protrudes on the top of the valve.

Maybe you'll find that the flywheel and motor pulley are overheated someday, or that pressure is not being built up as fast as it should be. That's usually a sign that the V-belt has stretched and slippage is causing friction and heat. That's why you'll check the belt tension, drive alignment and mounting bolts twice a month—to see that the belt has ½" deflection and no more.

Right now is a good time to mention the electric motor, because without the motor the compressor wouldn't even blow up a toy baloon. Most electric motors have oil cups and we don't need to tell you what they're for—but don't overlook them on the semi-monthly service. The brushes in the motor should be a point of interest as well. They should be checked for wear and if new ones are needed they should be seated in properly with No. 00 sandpaper—just like you would generator brushes.

We have heard of several systems of P.M. for compressors—the most popular one is keeping the score on the wall above the compressor with a burnt match stick. One trouble with this system tho' is that some Joe usually paints the wall every once in a while.

In order to help you keep a proper record of compressor servicing we have illustrated a simple form that can be made up on the duplicator by every workshop. Twenty-four of these forms will last you a whole year and if you hang 'em up by your compressor and **use** 'em properly you'll have a compressor you can blow about.

x y z

Just in case same trouble develops between semi-monthly checks here's a trouble chart which tells how to pick the most likely bugs—but fast.

TROUBLE CHECKING CHART COMPRESSORS

TROUBLE	REMEDY
Motor will not start	
1. Pressure switch open.	1. Release air from tank and inspect connections.
2. Broken connection.	2. Repair connection.
Motor will not come up to speed	
1. Commutator oily or dirty.	1. Clean or repair.
2. Starting against load.	2. Repair or replace bleeder valve or check valve.
3. Broken compressor valves.	3. Replace.
Overload Protection trips out	
1. Tight compressor.	1. Remove belts—try turning compressor flywheel by hand, should turn easily against no load.
2. Starting against load.	2. Clean or replace.
3. Belts too tight.	3. Adjust motor to give belt correct tension.
Burned out motor	
1. Tight or burned out bearings.	1. Repair or replace.
Compressor—Inefficient operation.	
1. Broken or carbonized valves.	1. Replace or clean valve or valve assembly.
2. Plugged air intake.	2. Remove and clean oil bath cleaner or if felt type cleaner is used replace felts.
3. Worn pistons and rings.	3. Replace.
4. Scored cylinders.	4. Rebore or replace.
5. Check valve leaks.	5. Replace seat washer or complete valve.
6. Leaks in pipe connections.	6. Test with soap and water or oil and repair.
Check Valve—Inefficiency or Leaks.	
1. Tank loses air when no air is being used with tank outlet valve closed.	1. Clean check valve or replace complete valve.
Pressure Control Switch—Inefficiency or Leaks.	
1. Leaks around head.	1. Replace diaphragm.
2. Bleeder valve expels air continuously while compressor is not running and air gauge shows dropping pressure.	2. Inspect and repair check valves.
3. Burned contact points.	3. Check voltage and repair points.
4. Bleeder valve bleeds when compressor is running.	4. Clean, adjust lever, or replace.
5. Motor continues to operate when switch is open.	5. Fused motor starter contacts, check wiring.

For B.F.s

TOUCHING ON TAPS

"Feel like an Alpine pass....."

ONCE upon a time there was a driver who was so careful and so conscientious that he never ran out of fuel. But this, as you can tell from the opening words, is only a fairy story.

Seriously though, this running out of fuel can be mighty awkward. If you've ever tried pushing a vehicle along to the nearest filling station (if there **is** a filling station) you'll agree. The gentlest of inclines feel like an Alpine pass, and you feel like something that rhymes with it.

The manufacturers of our D.N.D. military pattern trucks, do their best to save you from your follies. They install two separate fuel tanks on the vehicle and arrange things so that when one tank is emptied you may switch over to the other by turning a tap located on the cab floor. However, after one tank has been emptied it should be filled again at the first opportunity.

Each fuel tank on these vehicles holds about 12 gallons making a total of 24 gallons, which is a good supply of juice in any country, when both tanks are full. What we can't make some B.Fs. realize however, is that even with two tanks it is possible to run out of fuel. You can't just say "Abracadabra" or something like that and hold your cigarette lighter out to catch the splashes as a new lot goes in.

The only way to avoid being stuck somewhere without fuel is to learn something about the fuel tank valve and gauge switch. If you use the valve and gauge switch intelligently —and that shouldn't be asking too much— you'll **know** when you are running short.

Here's the position. The two tanks on your truck are connected to a changeover valve. You turn the valve handle to the right to draw on the right hand tank and to the left to draw on the left hand tank.

"..... Your buddies might not appreciate your engine stalling....."

Usually the valve handle and gauge switch are clearly marked "R" for right and "L" for left but we're putting this down to get things straight.

When both tanks are full—repeat this over to yourself until you're sure you've got it—use either, but make sure the fuel gauge switch is positioned so that the gauge will register on the tank you are drawing from. If you do this you will be able to switch to the other tank before draining the first tank dry and holding up the war while your smiling Captain assists you in restarting the engine.

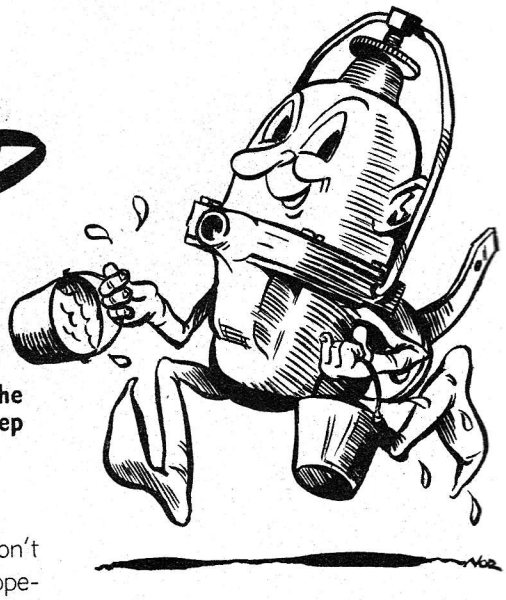
When you refill your tanks—and you'll do that as soon as possible after you switch to the second tank of course—you must remember to set the gauge switch to the gauge of the tank you are going to use.

Why? well, you set your switch to register on the tank you are drawing from because, aside from it passing out the wrong information if you don't, your buddies riding with you might not appreciate your engine stalling from lack of fuel when the gauge says full. Particularly if some Jerry starts taking pot shots at you with an 88mm because you're a stationary target.

In which case you're going to feel like the man who came down the ladder five minutes after someone had taken it away.

x y z

Meet the— FUEL PUMP



The engine's water-boy has a full time job on its diaphragm keeping the gas a comin' thru the lines. Here's the first of two articles on how to keep it in there pumping.

THE fuel pump does a big job—in fact it does two big jobs and without it you're engine isn't any more good to you than a harp will be to Hitler where he's going. You see, the fuel pump has to pull all the fuel that's put in your tank into the engine and while it's doing this it catches all the dirt, wool, water, old gum boots and what have you so that the carb won't get plugged up. If you think it over, it isn't uncommon for an army vehicle to use 1500 gallons or more of gasoline during a year, every drop of which goes through the fuel pump. How much dirt would you say goes with it?—Plenty brother, plenty. So it's just common sense that the pump should be cleaned regularly and often. It's especially important to clean the pump after a carburetor cleaning job—unless you want to clean the carb again in a week or so.

There are a few musts to remember when it comes to the simple operation of cleaning fuel pumps, and if you read this you'll be able to tell your grandchildren all about it. You wouldn't want to tell them the "how" tho unless you knew the "why". Here's the why—in words of less than six syllables.

If the fuel pump is in proper operating condition it will pump an adequate amount of fuel from the tank to the carburetor at all engine speeds. Here's how it does it.

All mechanical fuel pumps don't look alike but their principle of operation is the same—in other words when you know how one works you know 'em all. So we have dreamed up a couple of simplified illustrations not of an actual fuel pump, but to show how and why any fuel pump operates.

There are four main parts to the fuel pump not counting the filter part of it. There's the rocker arm which operates off the cam shaft just like the handle of a pump on an old fashioned well. Then there's the diaphragm which works like a bellows as it moves up and down. The linkage and pull rod connect the rocker arm to the diaphragm. Next there's the two valves. They are usually both the same type except that one is upside down in the pump as compared to the other.

In (Fig. 1), our little gadget is pulling or sucking gasoline from the gas tank. Notice the position of the rocker arm, diaphragm, inlet valve and outlet valve. When the rocker arm is pushed up (as it is in Fig. 1) the diaphragm is pulled down which results in a partial vacuum in the space above the diaphragm. You know what a vacuum is, but just to make sure we looked it up and according to our dogeared dictionary a vacuum is an empty space. In other words what happens in the fuel pump is exactly the same as what happens in your mouth when you suck a coke through a straw. First of all you suck—result—you make an empty space in your mouth. No air no nothing—only your uppers and lowers. Then atmospheric pressure on the outside tries to push into the empty space—the coca cola is in the way—so it gets pushed into your mouth.

In the fuel system on a vehicle—the atmospheric pressure pushes the gasoline out of the tank—through the open inlet valve in the fuel pump and fills the empty space above the diaphragm. While this is happening the engine cam-shaft is revolving and by the time the chamber in the pump is full of gasoline the rocker arm starts to move downward. When this happens the diaphragm spring forces the diaphragm up until it's in the position shown in our second picture (Fig. 2). As the diaphragm is moving up it pushes the intake valve closed and also pushes the gasoline out through the outlet valve and to the carburetor bowl. If you keep the bottle of coke in mind it's just like sucking a mouth full of coke then squirting it in the Sergeant's eye. (The action is the same bu

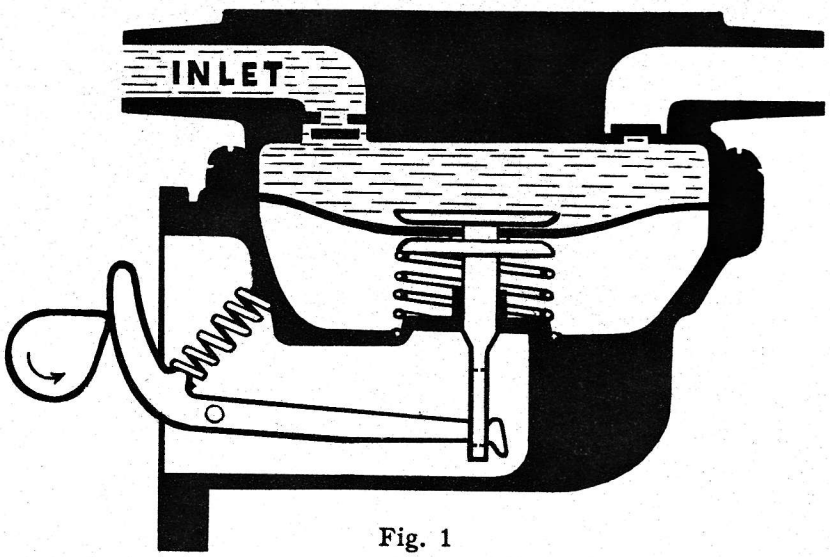


Fig. 1

the result would be different.) The rocker arm is pushed up by the cam and pushed down by the rocker arm spring. This spring keeps the rocker arm in contact with the cam at all times, if it didn't you'd hear a tap-tap-tap all the time the engine was running and you might think someone was beating out the boogie woogie on the pistons.

O.K. now we have the pump working but we all know that the engine doesn't require as much fuel for idling speeds as it does for high speeds so how are we going to control the fuel flow. Well the needle valve and the float takes care of that in the carburetor. But the fuel pump has to keep **its** pressure down so that the needle valve in the carb won't be pushed off its seat.

Here's how the pressure is controlled.

When the gasoline level in the carburetor bowl raises the float the float pushes against the needle valve which stops any more fuel entering the carburetor. The pressure that the float is capable of exerting on the needle valve is about 3½ pounds. As we said before, the diaphragm spring in the fuel pump is what pushes the diaphragm up and forces the gasoline to the carburetor. If the strength of the diaphragm spring is only 3½ pounds it won't have enough strength to overcome the pressure exerted by the carb float—result—the diaphragm stays down as it is shown in our Fig 1 and no more fuel is delivered to the Carb 'til the float allows the needle valve to open. All this time tho' the camshaft is revolving, therefore the fuel pump rocker arm is still moving up and down but it won't affect the diaphragm because of one thing, the linkage. Different pumps have different methods of connecting the rocker arm to the pull-rod. In our illustration we have shown a slot in the lower end of the pull rod so that the rocker arm can move up and down without moving the pull rod as long as the diaphragm is in the down position. In most pumps the rocker arm is connected to the pull rod by linkage but rather than try to illustrate all the different types we suggest you examine them closely the next time you have them in your hands.

As the fuel is used up in the carburetor bowl the float lowers and the needle valve opens slightly which reduces the back pressure to the pump and this allows a little movement of the diaphragm. The amount of movement of the diaphragm then, depends on how fast the fuel is being used by the engine.

Before starting on a repairing project its a good idea to know **when** it should be repaired because sometimes the fuel pump is blamed for trouble that's not in the pump at all. A quick check can be made while it is still on the vehicle. That way we'll often be able to save ourselves a lot of unnecessary toil and trouble.

If there's plenty of fuel in the gas tank yet there seems to be a shortage of it at the carb and you've got a good nose (as noses run) for locating trouble, you'll disconnect

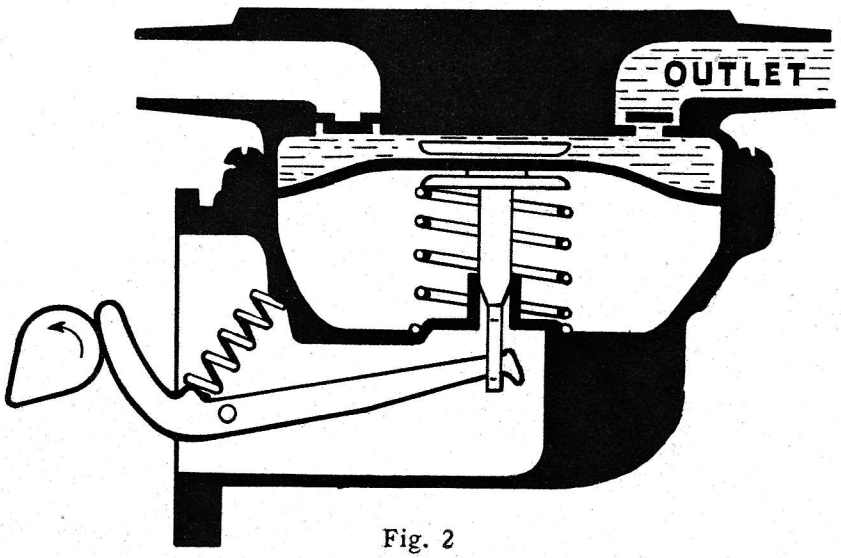


Fig. 2

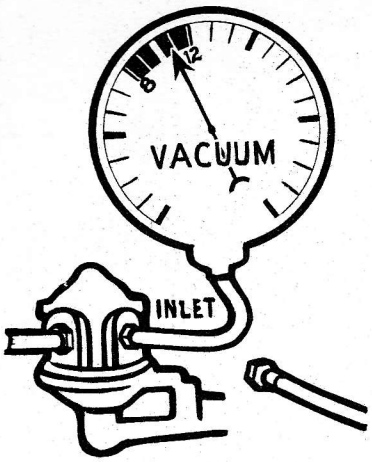


Fig. 3

the fuel line at the carburetor. Now if you crank the engine over with the starter a few times and the fuel pump spurts gasoline with considerable force the trouble isn't in the pump. If the flow is weak or there is no flow at all—the pump could still be O.K. Sounds like double talk doesn't it—but let us explain.

If the vent hole in the gas tank was plugged you'd get the same result, or if the gas lines and connections between the tank and the pump or between the pump and the carb were either leaky or plugged the fuel pump couldn't do its job. The logical thing to do then would be to check these items first before you heat your brains up trying to locate trouble in a pump that is perfectly O.K. A quick and simple method of finding whether the trouble is due to a clogged line between the pump and the carb is to disconnect the fuel line at the pump outlet connection, then crank the engine over with the starter. If gasoline spurts from the pump now—the disconnected line must be clogged. If there is still no fuel coming thru the pump you'd better check the lines between the tank and the inlet side of the pump. This can most easily be done by connecting a vacuum gauge to the inlet side. (Fig. 3). Now when you turn the engine over with the statrter you should get a vacuum reading of 8" or more. A lower vacuum reading would tell you you've got bugs in the pump—and 8" or more of vacuum would tell you the trouble is not in the pump. If you haven't got a vacuum gauge handy (but you should have) you can make a rough check of the vacuum by putting you're finger over the inlet of the pump—if there's a good vacuum when the the engine is cranked over with the starter you'll be able to feel your finger being sucked in. You can probably spare one finger anyway. The trouble then must be somewhere in the line to the tank.

Lets suppose you made these checks and found no pressure and no vacuum—you would know then that the pump is causing your grief. Just about this time we would find some Joes yanking the pump off—but we say "Not so fast Chum—not so fast, perhaps it's just a dirty screen or a leaky bowl gasket in the filter." O.K. so we'll remove the filter bowl and look for dirt or a bad gasket and here's a point to remember. If there's just a tiny leak around the gasket on the filter bowl air will enter the pump at that point instead of the air pushing the gasoline out of the gas tank. If this happens the space above the diaphragm will be filled with air instead of fuel—and that's bad because our engine won't run on wind. The same thing will happen if there's a leak around the diaphragm.

The thing to do then, is clean out the bowl and the screen. We'll mention right here that the valves make a swell booby trap for boobies so take care you dont knock any dirt in them when cleaning the pump while it's on the vehicle. A small piece of clean lint free cloth in the right places will keep the dirt out of the valves—but be sure to remove this gag when you're finished.

After it's cleaned put the bowl back on the pump with a new gasket. Never use an old gasket on the filter bowl because once the cork has been compressed it can seldom make a perfect seal again. Sometimes there may be a leak around the filter bowl even with a new gasket and a warped cover is usually the reason for this. As you will see in (Fig. 4) the bowl cover will bend or warp very easily if the wire stirrup is tightened too much so don't over do the tightening process. The cork gasket is soft and a perfect seal can be made without putting too much tension on the stirrup. The same thing applies to other types of filter bowls like for instance the Ford. In this case no retaining clip or stirrup is used but instead the bowl cover is tightened down by a small stud on the top. Ford fuel pump bodies with stripped threads are piled high in the salvage barrels of the depots just because a lot of so-and-so's try to make the fuel pump say "Uncle" before they stop the tightening business on the bowl covers. About one to two turns more than finger tight will make a perfect seal on the gasket, but make sure the stud hole hasn't got dirt in it because this would allow the stud to bottom before the cover was air tight and you'd do the strip act quicker'n Mme Foo Foo at Barney's Burlesque.

This article has left the pump on the vehicle. Next issue, full of ambition, we'll take the pump off and give it the complete grade A examination and going over. Bet you can hardly wait.

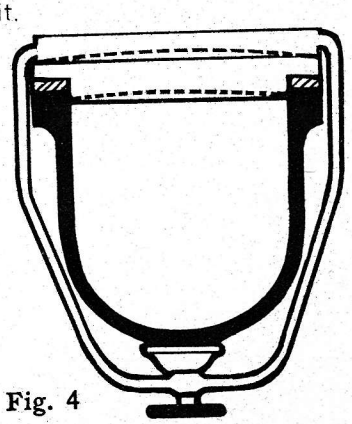
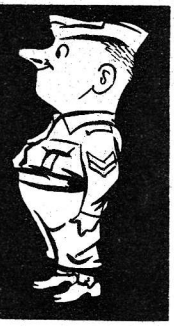


Fig. 4

EMER's DILEMMAs



Where's Elmer? Who's Emers? What's What? —whether you read this mystery drama or not you'll find out eventually—so why not now?

ACT 1

"Hi, Joe. The E.M.E.R's. are coming in shortly."
"E.M.E.R's?"
"Yeh, E.M.E.R's."
"Who nahelsa E.M.E R's?"
"I dunno, Joe, let's ask the Sarge".
"Hi, Sarge, who are these E.M.E.R. guys that are coming in?'
"E.M.E.R's.?"
"Yeh, E.M.E.R's."

"You guys are listening to too many soap operas."
Exit Joe and his buddy, leaving Sarge to scratch his dome.
Sarge decides that this will bear investigation so he looks up "One-pipper" Blinks.
"Sir, where are we going to put these blinking E.M.E.R's. who are supposed to be arriving next Tuesday?"
"E.M.E.R's? Sarge, we've got no more blasted room for troops.
I'll call the Coy. C.O."
"Hello, Exchange, give me Capt. Whosis."
"Blinks here, Sir, how much transport will we need to bring in these E.M.E.R. johnnies on Tuesday morning?"
"E.M.E.R's, Blinks? Must be a new group. I'll phone the O.C. and call you back. Better have three 3-tonners ready in any case."

"Hello, Exchange, connect me with the O.C."
"Hello, Sir, Whosis here."
"This is Jones—Oh—Whosis, what is it Whosis? (Aside) Don't you steal my crib, you blighter."
"Sir, will these E.M.E.R's. that arrive next Tuesday morning have all equipment?"
"E.M.E.R's?"
"Yes, sir, E.M.E.R's."
"Hmmm, E.M.E.R's. Oh yes, better have O.M. clear out that north drill hall in case they are fully equipped."
"Thank you, sir."
"Hello, Exchange, Colonel here, get me the D.O.C."
"Good morning, sir, just checking on this group of E.M.E.R's. that arrive next Tuesday at 1030 hours. Will they bring rations?"
"E.M.E.R's?"
"Yes, E.M.E.R's"
"Who the devil are E.M.E.R's?"
"They must be that new M.G. group,

the East Midland Essex Regt.
"Never heard of the blighters, Jones. I'll phone G.S. and see what it is all about."
"Very good, sir." (Exit the Col.)
"Sgt. Blondee, get me G.S. on the phone."
"G.S., sir?"
"Yes, yes, G.S., Ottawa."
"Very good, sir."

ACT 2

"Hello, Long Distance, calling Ottawa, G.S., please. D.O.C. calling, local 27."
"Thank you. Hello Ottawa."
"Ottawa here."
"Speyberry calling G.S. Ottawa, please."
"One moment, please." (Dials 9-1234).
"Biggs here, Dependent's Allowance Board."
"Speyberry calling G.S., sir."
"G.S.? You'll get them on 7213." (Dials 9-7213).
"Baggs here, N.R.C."
"Speyberry calling G.S., sir."
"G.S.? Better try 6666." (Dials 9-6666).
"What number are you calling, please?"

"9-6666."
"That phone has been been removed. You will get your party on 9-6222." (Dials 9-6222).
"General Staff, Boggs here."
"One moment, sir, Speyberry calling. Hello Speyberry, go ahead, please."
"Hello G.S., Speyberry here."
"Good afternoon, sir, Boggs here."
"Good afternoon, Boggs. What's this company of E.M.E.R's that are arriving here next week?"
"E.M.E.R's., sir?
"Yes, yes, E.M.E.R's."
"Oh, yes, E.M.E.R's, (Aside to Cpl. Bun) What the devil are E.M.E.R's?" E.M.E.R's., sir? (Cpl. Bun has his application in for transfer to the new R.C.E.M.E. and knows all the answers). **"They are the new form of instruction called Electrical and Mechanical Engineering Regulations put out by D.M.E. to cover all maintenance, sir."**
"Hello, sir, E.M.E.R's. are the new maintenance instructions put out by R.C.E.M.E."
"WHAT?"
(Boggs repeats).
"You mean that bundle of papers that Grogs here is piling up on his table?"
"That must be them, sir."
"Thanks Boggs!!"

ACT 3--SAME AS ACT 1 AND 2 EXCEPT IN REVERSE.

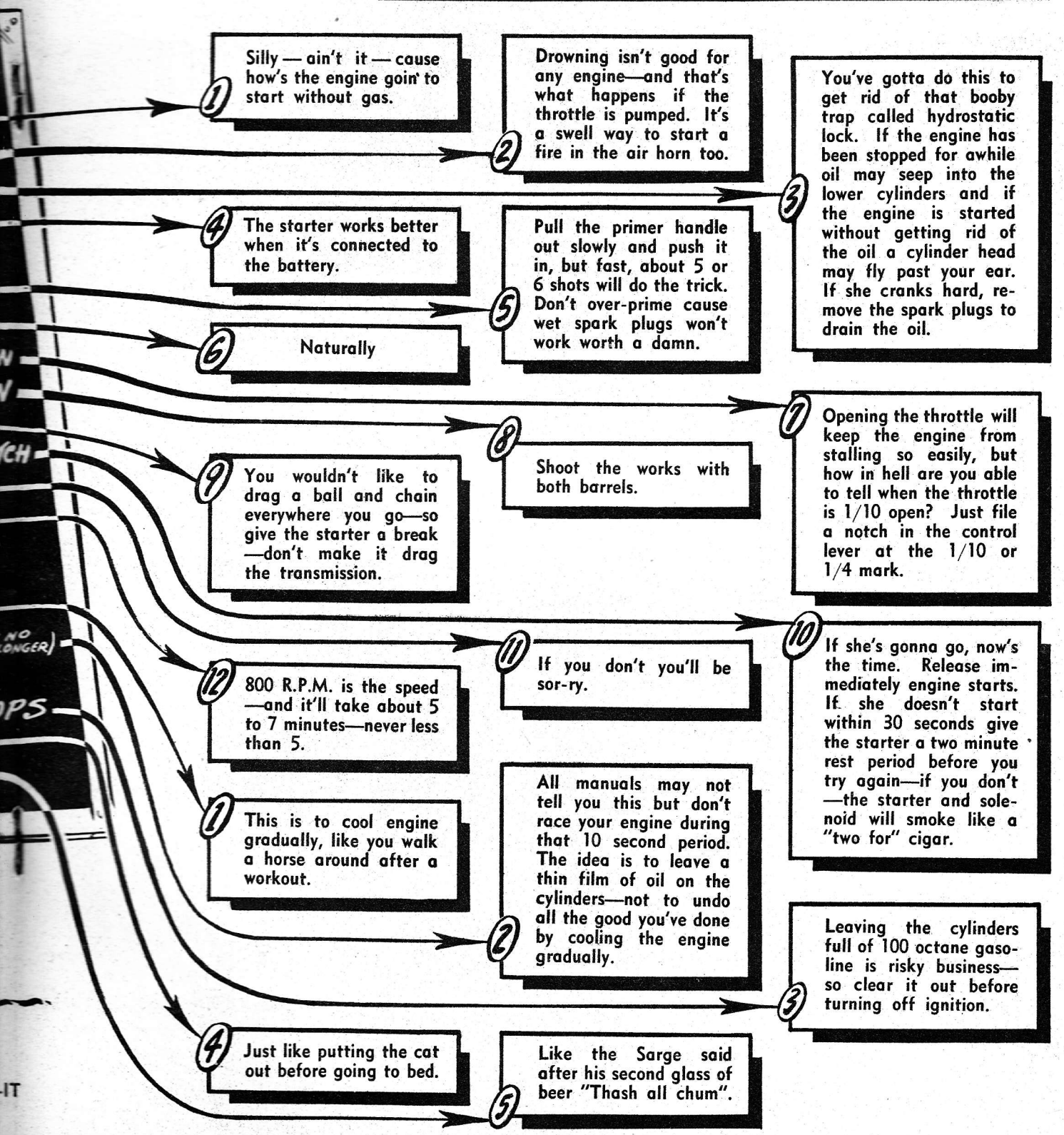
WHAT THE ELL'S S.I.

— TO START ENGINE —
1- OPEN GASOLINE TANK VALVES
2- DO NOT PUMP THROTTLE BEFORE CRANKING
3- HAND CRANK ENGINE AT LEAST 40 TURNS
4- SWITCH MAIN BATTERY SWITCH "ON"
5- COLD ENGINE - PRIME BY HAND PRIMER.
DO NOT PRIME HOT ENGINE
6. SEE THAT GEAR SHIFT IS IN NEUTRAL
7- OPEN ACCELERATOR ONE TENTH TO ONE QUARTER OPEN
8- TURN ON MAGNETO SWITCH TO "BOTH" POSITION
9. DEPRESS CLUTCH PEDAL
10- TURN STARTER SWITCH AND BOOSTER COIL SWITC
11- CHECK OIL PRESSURE GAUGE
12- WARM UP ENGINE
— TO STOP ENGINE —
1- IDLE ENGINE AT 800 R.P.M.
2- RUN ENGINE AT 1,000 R.P.M. FOR 10 SECONDS (
3- OPERATE FUEL CUT-OFF SWITCH -
AND HOLD IT ON 'TIL ENGINE STO
4- OPEN MAIN BATTERY SWITCH
5- TURN MAGNETO SWITCH TO "OFF"
S1-50
TANKS

WHEN WINTER COMES—LET S.I. 50 BE YOUR GUIDE—IT COVERS THE WHOLE CHILLY STORY.

...50...?

We started out with the idea of giving you guys all the latest information on standardized caution plates telling you how to start and how to stop the Radial engine (R975-C1) in your tank. It took us about 30 seconds of nosing around to find out that there just ain't any such thing. However, thumbing through our pile of Esquires, we found Service Information Bulletin number 50 dated 14-12-43 which gives the standard laid down procedure. Here's the high lights.
For further details see your local S.I.-50.


1 Silly — ain't it — cause how's the engine goin' to start without gas.
2 Drowning isn't good for any engine—and that's what happens if the throttle is pumped. It's a swell way to start a fire in the air horn too.
3 You've gotta do this to get rid of that booby trap called hydrostatic lock. If the engine has been stopped for awhile oil may seep into the lower cylinders and if the engine is started without getting rid of the oil a cylinder head may fly past your ear. If she cranks hard, remove the spark plugs to drain the oil.
4 The starter works better when it's connected to the battery.
5 Pull the primer handle out slowly and push it in, but fast, about 5 or 6 shots will do the trick. Don't over-prime cause wet spark plugs won't work worth a damn.
6 Naturally
7 Opening the throttle will keep the engine from stalling so easily, but how in hell are you able to tell when the throttle is 1/10 open? Just file a notch in the control lever at the 1/10 or 1/4 mark.
8 Shoot the works with both barrels.
9 You wouldn't like to drag a ball and chain everywhere you go—so give the starter a break—don't make it drag the transmission.
10 If she's gonna go, now's the time. Release immediately engine starts. If she doesn't start within 30 seconds give the starter a two minute rest period before you try again—if you don't—the starter and solenoid will smoke like a "two for" cigar.
11 If you don't you'll be sor-ry.
12 800 R.P.M. is the speed—and it'll take about 5 to 7 minutes—never less than 5.
1 This is to cool engine gradually, like you walk a horse around after a workout.
2 All manuals may not tell you this but don't race your engine during that 10 second period. The idea is to leave a thin film of oil on the cylinders—not to undo all the good you've done by cooling the engine gradually.
3 Leaving the cylinders full of 100 octane gasoline is risky business—so clear it out before turning off ignition.
4 Just like putting the cat out before going to bed.
5 Like the Sarge said after his second glass of beer "Thash all chum".

CONTRIBUTIONS

Do you know how to make maintenance easier? We're asking you.

Maybe you've got a better way of doing a job—perhaps a new trick for your trade.

If so, write CAM and let the rest of the boys in the field in on it.

ACCIDENT BOARD

HANGING in a conspicuous spot at the doorway of the garage of No. 4 District Coy R.C.A.S.C., Montreal, this board, the brain child of Lieut A. M. Dumouchel is doing its stuff in the prevention of accidents among the drivers of this unit--backing it up is the fact that since it's been up, the accident rate has come down.

Note the bulletin space in the corner. When there **is** an accident the name of the responsible one goes up here. Passing Joes can then point the finger and say "he dunnit" thereby discouraging the culprit from getting his name up again. On the other hand, a note on there showing a good accident-free record is going to encourage the boys to be extra careful to keep it that way.

The picture of the actual board tells its own story. Any one familiar with the general operation of a saw and a hammer can whip it up in a matter of minutes and a bit of neat lettering along the lines illustrated will complete the job.

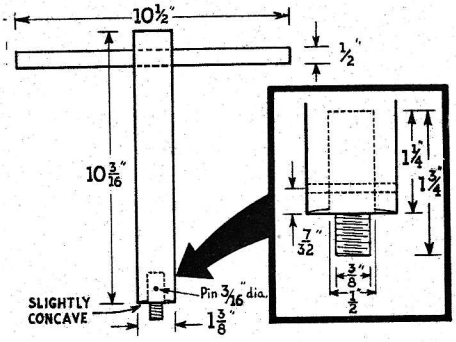
The idea is passed on with the thought that it will appeal to all "Safety first" conscious units.

Most people do care what the neighbours say—that's why this bill board helps the accident record by making it public.

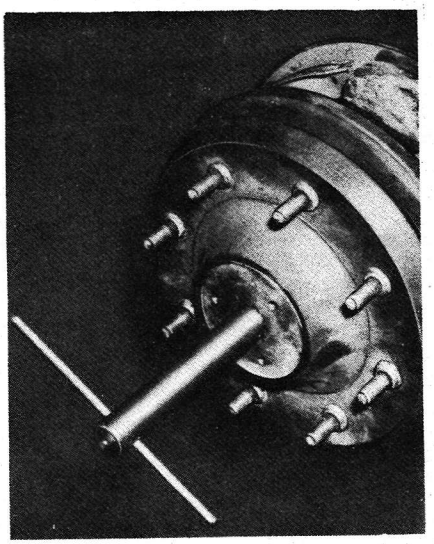
HUB INSTALLATION

In use at the No. 1 Proving Ground Detachment Workshop Ottawa is this "Plain Jane" gadget for installing front wheel hubs on C.M.P. 4 x 4 and 6 x 6 vehicles equipped with Rzeppa type front axles.

Q.M.S. C. D. Wilson is the man of the month in them there parts as a result of this time and labour saving refugee from a scrap pile.



When installing the hubs, the tool is attached to the axle shaft by screwing the threaded tit into the grease connection hole in the outer end of the shaft. The hub is then slipped over the outer end of the tool and guided into place on the splines of the axle shaft by the centering action of the tool.



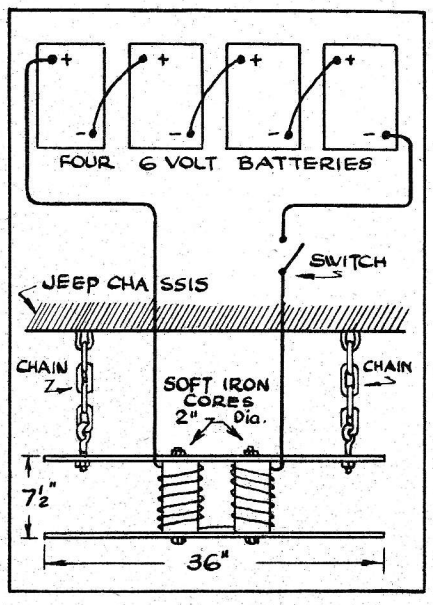
Pictured here is a hub being guided into place by the tool (the one you make may not be as well trained as this to start with and will probably require the help of a mechanic).

This letter came in by carrier pigeon the other week and we're happy to pass it on "as is"—even if the pigeon did eat the four do-nuts we were saving for our lunch—(and then added insult to injury.)

Dear Ed:

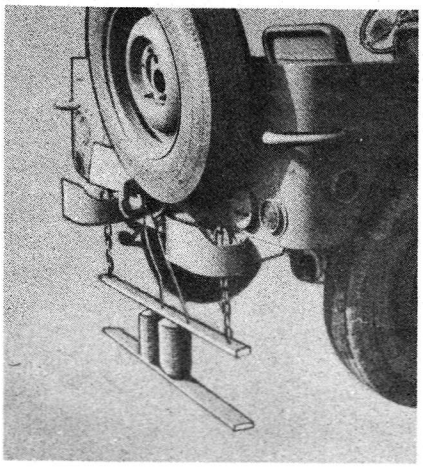
Ye Gods, what is more disconcerting and annoying to a conscientious, energetic driver, or even a lazy one, than to see two inches of a 4" nail protruding from a tire on his beloved truck. With the well known rubber shortage it does not help matters either.

It seems that carpenters when constructing new buildings work on a percentage basis on nails—50% in the building and 50% on the ground. This condition was extremely grave in Camp Shilo. Every day tires were discovered with nails, and sometimes as many as three nails in one tire. It was felt by the Officer i/c of the Ordnance M.T. Workshop that something would have to be done about it. Working parties were organized and in one evening 75 lbs. of nails were picked up. This was all well and good; but after the first famous Shilo wind storm, Lo and Behold, as many more nails were in evidence as there was before the picking bee.



At this point in a break-off period discussion, a clever Sergeant suggested an Electro Magnet. His suggestion was immediately acted upon and the following instructions for constructing a magnet similar to the one built by the Ordnance M.T. Workshop are submitted.

Take two soft iron cores 2" in diameter and 7½" long. 250 ft. of No. 12 double wire cotton covered (no rubber). After the two coils are wound dip them in a superior grade of varnish. (not shellac) Mount these



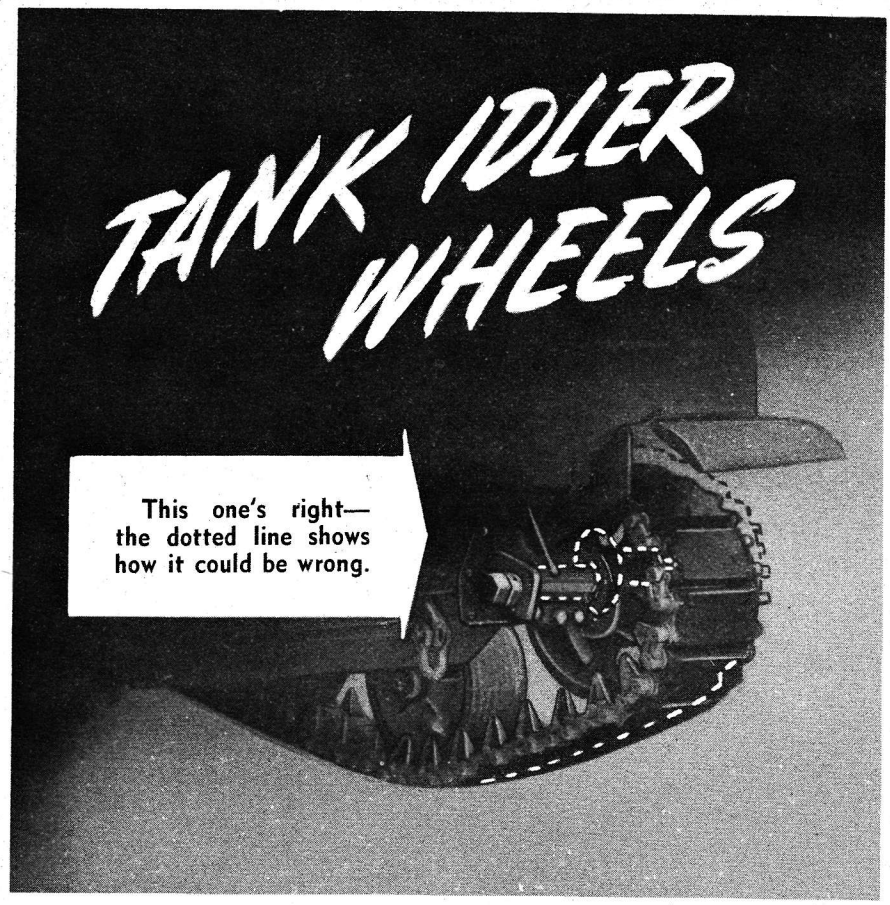
Not a bird perch—but the champeen nail picker-upper around Shilo way. This is how it looks in action—the lower rail just touching the ground.

as closely together as possible between two steel bars 3' long. Chains are fastened to the bars to tie the electro magnet to the back of a Jeep. The springs on the Jeep should be blocked to prevent bouncing. Four batteries hooked up in series furnished electrical power. The magnet being dragged along the ground effectively picks up the nails out of the sand. A switch can be installed, and opened to release the nails in piles where they can later be picked up.

Our Electro Magnet has been loaned to every unit in Camp for the past year, and the nail situation in tires is practically nil at last.

(S.E. Cuthbertson) Lieut.
Officer i/c M.T. Workshop.

1. **What does C.P.M.S. mean?**
2. **How do you make a daily check of the clutch?**
3. **What would you look for when checking the vehicle tires besides checking them for proper inflation?**
4. **What would you look for when making an examination of the springs?**
5. **What would you do besides scratch your head, if you found one cell of the battery dry and the other cells O.K.?**
6. **What shouldn't you do if you find the starter motor is sluggish when you make the daily check on it?**
7. **Who is liable to foot the bill if you smash-up your vehicle because of worn out brakes?**
8. **What is the correct battery electrolyte level and how often should it be checked? Electrolyte is the mixture of acid and water in the battery and it shouldn't be used to remove stains from your best Sunday uniform.**



WHEN they're up they're wrong. When they're down they're right.

The fact that you can adjust track tension by moving them either way probably accounts for our tear dimmed eyes falling on lots of mediums running around with their idlers up.

Recent trials and tests showed that there was little to choose between the two positions in so far as wear and tear on the suspension and track was concerned.

"So why the fuss", says Timothy, our number one boy, "leave the lads alone if there's no harm done and quit pickin' on 'em."

"Well", says we, patting Timothy on the back of the neck in brotherly fashion with a handy leaf spring. "Its those designers and the people who manufacture these Tanks for one thing. They like them to be down—and knowing these blokes as we do, we don't think it's just a whim—they're not the whimin' type".

"Actually, they say, not much harm will come of running the tanks with the idlers up while on the normal use over here. But its a bad habit to take overseas with you. In the upper position the angle of descent from obstacles and ramps is changed. This might prove embarrassing at a very critical moment—by damaging the wading equipment, for example, when leaving the ramp of an invasion barge."

"Add to this the fact that it's easier to tighten the track by lifting up on the wrench—especially if there isn't much manpower readily available—because a jack can be used under the end of the wrench."

Which makes it simple common sense to say—why cultivate a bad habit when it's easier to do it the right way.

x y z

THE ANSWERS TO THE QUIZTIONS ON PAGE 173

1. C.P.M.S. stands for Compulsory Preventive Maintenance Schedules. It also stands for your safety—and brother, thats important to both you and the army.

2. Check the clutch for smoothness of operation, it shouldn't grab or jerk. There should be 1" to 1½". free travel of the pedal. A clutch won't last long if there's no free travel so this check's important.

3. See that all valve caps are in place and are tight. Examine tread and side walls for cuts, bruises, cracks, scuffs and unusual tread wear. Remove nails, stones, glass, pedestrians and what have you. This is especially important between duals.

4. First look for the springs. Then examine them for broken leaves, cracks, sagging, loose clips, angle of spring shackles and position of spring on the saddle. If the spring has shifted you will see marks of their original position. Report any of these conditions on your C.P.M.S.

5. If one cell of the battery looks dry it spells trouble with a capital "T". It may be a cracked battery case or it may be due to internal trouble in the cell. Report the trouble at once and the battery should be serviced in the battery shop before it is used again.

6. Don't run the battery down before the trouble is located and corrected. Some causes of sluggish starter operation are, heavy oil in engine, tight bearings or pistons, discharged or weak battery, defective starter switch, poor battery connections or cables—or it could be in the starter itself. Correct the trouble whatever it is before more serious trouble developes.

7. If your brakes don't operate properly because they're out of adjustment or worn—then you're to blame if you fail to report it. This applies to other parts of the vehicle as well—such as lights, horn, mirrors etc. Don't be the fall guy—don't drive defective vehicles.

8. Distilled water should be added to each cell so the level is ¼" to ⅜". above the seperators. On batteries with safety-fill covers you may not be able to see the level of the electrolyte but there is no danger of over-filling them if you do the filling job properly. Over-filling is bad and not filling at all is worse so don't overlook this important check every day.

Sgt. O'Sweat's— HEADACHE and ASPIRIN Department

Maybe you didn't know we had a Yogi on our staff but Sgt. O'Sweat's got so much on that old crystal ball he's able to read our mail before we open the letters. If you have any maintenance headaches don't reach for an aspirin—don't bother the Padre —just bring your troubles to O'Sweat. Somewhere there's an answer to your problem and the Sarge knows where.

Address your questions to Sgt. O'Sweat, Cam, Directorate of Mechanical Engineering, Department of National Defence, Ottawa.

Dear Editor:

We installed a new cylinder head gasket on the left bank of a Ford Station wagon a while ago and ever since it has been using more oil than it should. The engine is practically new, and it used hardly any oil before the new head gasket was installed. Now it is pumping oil in the left bank. No other work of any kind was done, other than replacing the head gasket. Can you tell us how a head gasket can cause oil pumping?

Sgt. W. C. McA.

Dear Sgt:

The new gasket isn't causing the oil pumping but from where I sit it looks like you didn't use a tension wrench on the cylinder head nuts. When cylinder head nuts are not tightened evenly the cylinders are often distorted enough to cause high oil consumption, this is due to the piston rings not being able to seat properly in the out of round cylinders.

We have shown in the illustration the correct sequence for tightening the cylinder head nuts on a Ford V8. A torque wrench should be used to tighten the nuts after the engine is warmed up, tighten to 50 foot pounds.

O'Sweat

The Editor, Cam:

We have had a lot of trouble removing broken axles on some Chevrolet trucks. It seems that the method of removing the good axle from the opposite side and then driving the broken axle out with a long steel rod won't always work. This is because on some jobs the differential spiders have a solid centre and the steel rod won't push right through the differential.

We have found though, that with the help of a piece of wire we have been able to slip a noose over the broken shaft and it will grip the broken axle part tightly when the string is pulled. In this way we are able to remove the broken axle without taking the assembly apart.

Pehaps some of your other readers would like to benefit from our idea so we'll pass it on to you.

Sgt. R.L. and Pt. K.W.

Dear Sgt. and Pte:

Good work men, you have a swell idea there but someone else thought of the idea too. In fact this method was described and illustrated in CA Service Information Bulletin G-4 dated 2-10-43. I would suggest that you give this bulletin a quick glance yourself just to compare it with your idea. The suggestion shows that you boys do a little figuring on your own though.

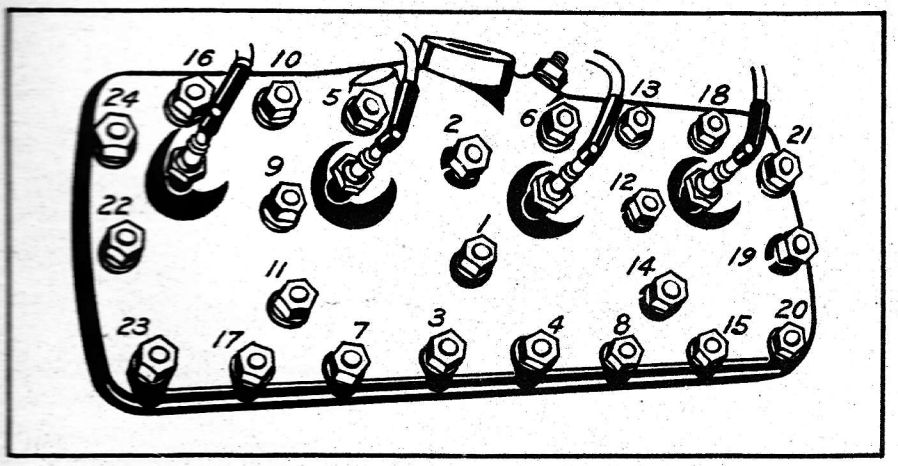
O'Sweat

Dear Editor:

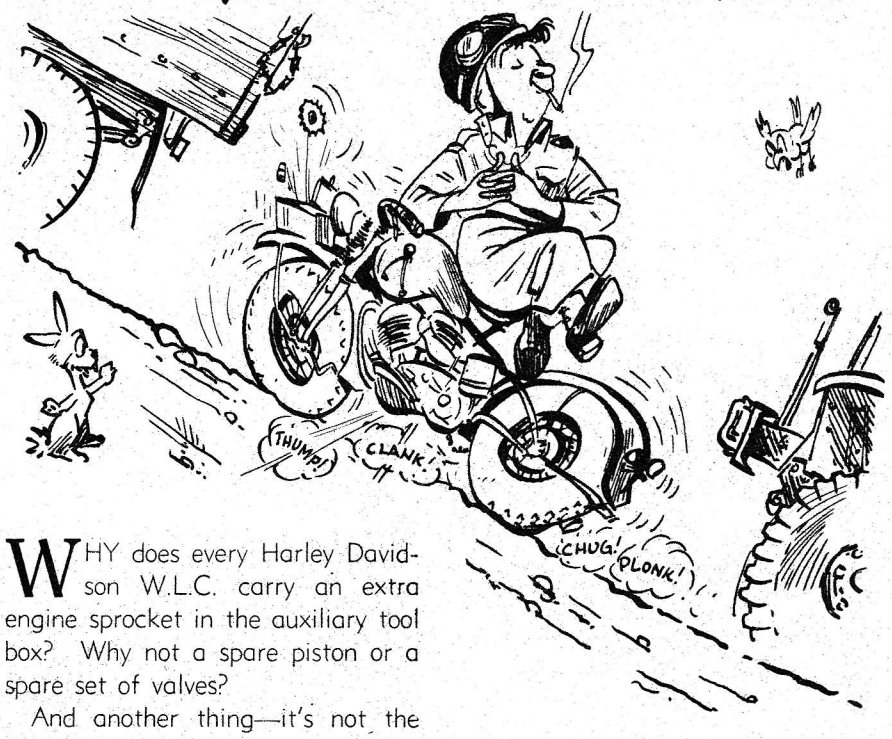
We have been having a little argument in this camp and as we have not been able to settle it we decided to ask you to settle it for us.

Some of the boys say that an engine will idle for hours without having a bad effect on any of the

(Continued on next page)



MOTORCYCLE SPROCKETS



WHY does every Harley Davidson W.L.C. carry an extra engine sprocket in the auxiliary tool box? Why not a spare piston or a spare set of valves?

And another thing—it's not the same size as the one on the engine. So mebbe it's for use when pulling a sidecar?—But they don't equip the W.L.C. with a sidecar.

Well what the Hellen of Troy is it for then?

It's a simple matter my dear Watson. The Harley has two cylinders set at an angle of 45°. When travelling in high gear at speeds around 20-25 mph the engine is turning over quite slowly and due to the fact that it's a two cylinder job and not a V8 it will run very roughly —particularly on acceleration from these speeds. This jerky running is due to the low r.p.m. and the uneven firing interval between the two cylinders. As soon as the motor starts 'reving' this uneven firing ceases to be noticeable.

Now suppose you're in a district where the country is mountainous or very hilly. Convoys are pretty slow. Twenty-five miles per hour is about their top average. First thing you know you're changing gear like you was working a slot machine on your lucky day—or else you're lugging the motor in high gear and playing hob with the engine bearings, stretching the chains, straining the transmission, loosening the rivets that attach the rear sprocket to the brake drum and breaking the heart of every experienced motorcyclist that hears the havoc taking place.

You don't have to do this—so what do you do. Right—you guessed it.

You take off the large engine sprocket (30 tooth) and put on that small (27 tooth) one that's sitting in the auxiliary tool box. This lets the engine rev higher for the same road speed in each gear. The higher r.p.m. gives you a smoother motor—you can run in high gear at 20 mph without jerking the stuffing out of the m'cycle.

Cross country driving in soft soil conditions or sandy areas is another instance where the smaller sprocket is the best bet. Under these conditions, plenty of power, as well as smooth power, is what's wanted. High engine r.p.m. is the way to get more power and the smaller sprocket provides this high engine r.p.m. for every gear.

There's just one last point. Maybe you're not called upon to ride in slow convoys—or get off the good highways very much. In that case stick to the larger sprocket. It saves your motor from having to turn at unduly high r.p.m. for normal highway cruising speeds.

O'SWEAT—

(Continued from page 175)

parts. Of course we never let any of the vehicles idle for hours but we would like to know if letting a motor idle for a considerable time would do it any harm.

Cpl. B.R.L.

Dear Corporal:

So you want me to decide who buys who's beer. Well the answer is quite simple because long periods of idling is bad medicine for all engines that have been designed to operate mostly at higher speeds.

You probably realize that unnecessary idling wastes fuel but aside from that it will cause **crank case dilution.** Idling mixtures must be necessarily rich so that the engine will idle properly. Some of the raw gasoline is bound to find its way past the pistons and end up in the oil. Even at higher engine speeds some gasoline will get into the oil but because the engine temperature is higher then than at idling speeds the gasoline in the oil has a better chance to evaporate.

There are more reasons why engines shouldn't be allowed to idle any longer than is absolutely necessary—but this should settle your argument.

O'Sweat

A NEW ANGLE ON CAM ANGLE

Twere busy as 'ell in the shop that day and Sergeant O'Toole were a wee bit dismayed.

The jobs that were waitin'—let's not be mistaken

Were "do-overs" and "come-backs" cause of poor education.

On this day of all days when work was piled high

A meeting was called by the Sarge on the sly.

A pep talk he gave to his fitters and mechs.

What he said will be found in the following text.

WE'RE all humans—or are supposed to be—and when anything new comes along our first reaction is usually curiosity. After poking our nose into it and discovering its something we know little or nothing about, our curiosity just naturally turns to pooh pooh criticism. In other words, we humans—even if only slightly so—raise the bags under our eyes and leave the newcomer alone.

The newcomer in this case happens to be distributor Cam-Angle. Its not really new to lots of guys but its meaning and importance is as little understood as where the flies go in the winter time.

Without getting too techincal, let's say **the Cam-Angle of the distributor is how far the distributor cam turns while the contact points are closed.**

Because the cam revolves in a circle we can express how far it turns in degrees. In other words, Cam-Angle is the **dwell** of the contact points expressed in degrees.

We never had to bother about Cam-Angle before—so why bring up the subject now? Well, before high speed engines with high speed ignition systems were in use there were a lot of things we didn't bother about. For instance, you never worried much about vacuum spark advance or octane selectors on Model "A" Fords, did you? In those days cam-angle was only a problem to the manufacturers, but as engine speeds increased and compression ratios were made higher it became more and more important to improve on the action of the contact points and coil. On slow speed engines there was plenty of time for the ignition coil and contacts to operate, but on high speed engines the ignition system had to deliver a stronger spark in less time. Even at only 40 miles per hour the ignition coil has to deliver 130 high tension sparks every second on an average 8 cylinder engine. Just try to operate your cigarette lighter that fast Bub. The action of the contacts in the distributor plays a very important part in making this spark occur at the right time and in making the spark hot enough and strong enough to properly ignite the fuel.

The moment the distributor contacts close, current flows from the battery, through the coil, through the points and back to the battery. While this current is flowing through the circuit the coil is being energized. It gets loaded. The moment the points separate a high tension spark is "fired" by the coil. If the length of time the points remain closed is too short, the coil won't be properly energized and a weak spark will result. If the dwell of the contact point closure is too great, too much current will flow through the coil and this excessive current will overheat the coil windings and also burn the contact points, and will result in just as weak a spark as not enough dwell. It's just like pressing your pants with a hot iron—too little heat in the iron—no press. Too much heat in the iron—no pants.

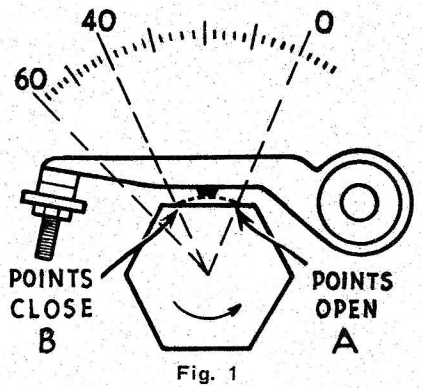


Fig. 1

You can see that the cam has moved through 40° to get from A to B.

The manufacturers have taken all of these things into consideration and have determined the exact number of degrees the contacts should remain closed to give the proper operation of the coil on their particular ignition systems. Therefore the manufacturers' specifications should be the last word when it comes to adjusting contact points.

How to Measure Cam-Angle

On a 6 cylinder vehicle a 30 degree cam-angle would mean that the contacts are closed one-half of the time and open one-half of the time. If there are 6 lobes on the cam the contacts will open and close 6 times during one revolution or every 60 degrees (360 divided by 6). However, 30 degrees isn't necessarily the correct cam-angle for all 6 cylinder distributors. Our bird's-eye view of a distributor in Fig. 1 shows the position of the cam when the contact points are closed . . . . . during the time the points are closed this cam turns 40 degrees. The points will remain open 20 degrees, then they will close for another 40 degrees. Therefore the CAM-ANGLE in this case is 40 degrees. Nothing to it is

there?

Why not use a Feeler Gauge?.

The manufacturer figures out the cam-angle when he designs the ignition system and puts this information in the manual. Everybody hasn't got cam-angle gauges tho', so he measures the gap between the contacts with a feeler gauge or dial gauge and also puts this information in the manual—just so anyone without a proper gauge won't be stuck. But at best a feeler gauge adjustment is only approximate for several reasons.

First, the human element enters into feeler gauge settings. That is, no two greaseballs develop the **same** delicate feel of a feeler gauge. Result— the cam-angle, when adjusted with the feeler gauge, may vary several degrees.

Second, the thickness of the fibre rubbing block on different contact arms will vary slightly and this will vary the cam-angle, even tho' the same exact contact spacing is used, as would be the case if you used a dial gauge. A difference in the thickness of the fibre rubbing block of only a couple of thousandths will change the cam-angle by several degrees, due to the increased ratio of movement between the fibre block and the "point" end of the contact arm. This is shown in Fig 2

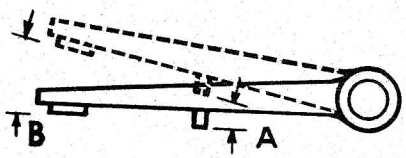
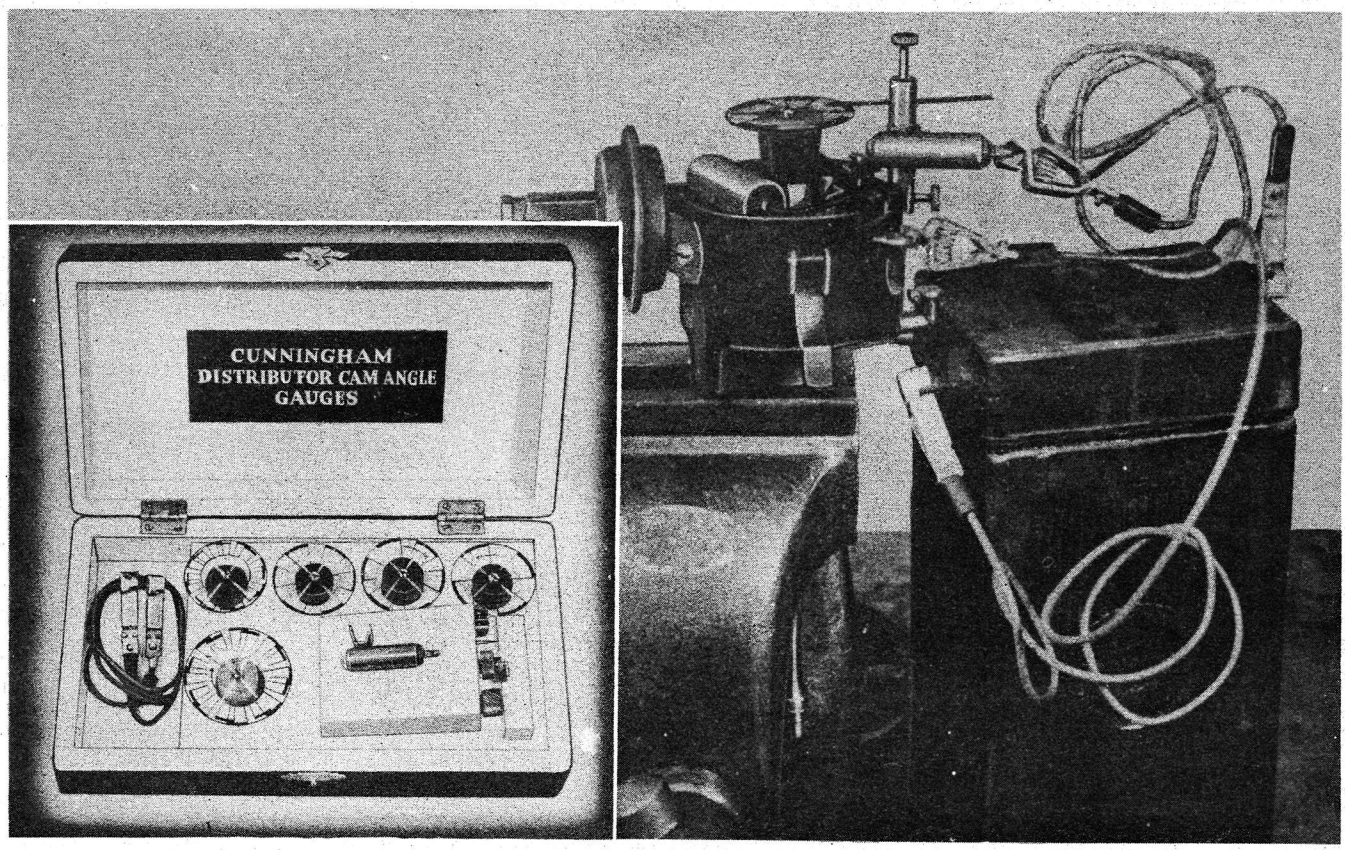


Fig. 2—*Because the contact arm is like a lever any slight movement at 'A' is exaggerated at 'B'.*

The wearing down of the high spots of the cam itself will change the "required" contact spacing. For proper cam-angle a new vehicle may require a contact spacing of say .018". But after the vehicle has run 10,000 miles and the high spots on the cam have worn a little it may be necessary to space these contacts .020" to obtain the proper cam-angle. Or wearing of the pin that the contact arm pivots on may change the spacing to .016" for proper cam-angle. Also variations in distributor plates, contact arm bushings, the angle of the pin upon which the bushing rides all cause the feeler gauge method of adjusting to be inaccurate.

By adjusting the contacts to the recommended cam-angle as listed in the manufacturers' specifications, all these variations are automatically overcome and only then will you get perfect ignition.

We have been told by the bird that usually whispers things in our ear it wont be very long now 'til all workshops will be able to adjust distributors by cam-angle gauges, so get hep to cam-angle and get ready to put your feeler gauges away. The same little bird has given us some info. on the gauges along with an illustration—so here 'tis.



There are five discs in the kit and a different cam-angle is marked on each disc. The set of five discs are all you'll need to adjust the cam-angle on your "B" vehicles. When you make the adjustment the proper disc and adapter for the distributor you are adjusting is placed on the shaft in place of the rotor. The distributor is held in the bench vise while you are doing this . A small 6 volt test light is connected to a battery so that the light is "on" when the points are closed and the light goes "off" when the points open. A small pointer is fixed just over the edge of the disc and lines up with the cam-angle markings on the disc. Now all you have to do is turn the distributor shaft and presto—the test light tells you how long the points **are** closed and the disc tells you how long they **should** be closed. To adjust the contacts to the correct number of degrees of dwell you increase or decrease the point spacing. To increase the cam-angle, decrease the gap—to decrease the cam-angle, increase the gap. After the correct cam-angle is obtained the contact gap may not be the same as in your specification book, but don't let that worry you because, like we said before, it's the number of degrees that's important and not the number of thousandths of spacing.

x y z

BLUNDERBUSS

IT appears that at the time of this writing, the Canadian Army is going in for digging. No, not shovelling. We all know they do that, but digging. You see it's this way. When the muzzle of the present service rifle, is shoved in a general downward direction, either accidentally or with malice aforethought and makes contact with dear old Mother Earth, a snowbank, or even Junior's sandpile, it digs a little circular hole. Now this looks very pretty and would no doubt, in a theatre of war, confuse enemy scouts no end, but at the same time, it packs a neat little plug of earth, snow or sand into the aforementioned rifles' muzzle.

"Well, so what", says Private Kizel.

"Yeah, so what", echoes Private Stock. "The next shot will blow that little plug so far, that the Zulus will be using it on next years victory garden"

"Why shore", says we, "**But!** When the bullet, travelling down the rifle barrel at some considerable speed, hits the obstruction near the muzzle, even if the obstruction is only a light plug of snow, or even a few grains of sand, its speed is checked, mind you, not noticeably so, but none the less, checked. Now the exploding powder gases driving said plug out of rifle barrel develop tremendous pressures and when the slug slows down, these gases, which same are'nt waiting for any slowpoke bullet, just shove past it and away to the great outdoors. Of course, when shoving past that ole loitering bullet, they put the neatest buldge in the end of the barrel, and this means misery for the P.B.A. *

Now blunderbusses and bell-mouthed fowling pieces went out of style some hundred odd years ago and the present service rifle is an efficient modern development of an old reliable proved military firearm. So wouldn't you think they could be a little more careful and take a slightly more notice of where they go shoving the muzzle of their rifle. Of course, I know that you personally would never be careless enough to get dirt in the muzzle of your rifle and bulge it into a poor copy of Oliver Cromwell's G.I. shooting irons, but would you please watch that wacky guy over there on your left and see that he does'nt either.

Hmmmmm ?

* *Poor . . . . . Armourer*

NO CAN DO!

Please don't write to CAM asking for a personal subscription. We have to answer—sorry, no can do. Why? for several reasons—The main one being there are a limited number of CAMs printed—these are shipped in bulk lots to each military district for distribution. Except for the copies we save to show our grand-children we ship the works. Your unit gets its share of the CAMs available—from there on it's a case of PASSING IT AROUND.

Powerful Stuff

IF you want to beat Hitler to Hell don't read this.

You wouldn't sit on a keg of T.N.T. and smoke a cigar would you? In fact we doubt if you would even want to sit on a keg of T.N.T. We've seen some fellows though that have done lots worse things—such as welding a gas tank on a vehicle.

We happen to know a professor—he's a nice sort of fellow in an absent minded way, though he's as blind as a bat since he donated his glasses to the salvage drive.

The Professor has given us some dope about gasoline and we thought you would like to hear what he said.

The two common elements that gasoline consists of are hydrogen and carbon. About 15 per cent by weight of gasoline is hydrogen, which is the lightest of all elements. That's the stuff they sometimes use in balloons to make them rise, it also forms in the top of the cells in storage batteries. Hydrogen will burn and when it burns in a small space will cause a terrific explosion. Enough heat is liberated by the burning of one pound of Hydrogen gas to raise 62,100 pounds of water one degree Fahrenheit. (That's enough water to ruin the beer in every sergeants' mess in Canada.)

Carbon, the second element in gasoline is another very common element. The purest form of carbon is the diamond but we also find it in coal, lamp black and all sorts of things. The average army private is about 17% carbon (Some Sergeant's we know may run a bit higher). Carbon also has a high heating value and the burning of one pound would raise 14,600 pounds (or more than 7¼ tons) of water one degree Fahrenheit.

The combination of these two highly important elements hydrogen and carbon makes the ideal fuel for the gasoline engine.

If you were asked which had more energy per pound—gasoline or pure nitroglycerine,—and you said gasoline—you'd be correct. In fact, if we could use nitroglycerine instead of gasoline in an automobile we would only get about 3 miles per gallon instead of the 18 or 20 miles per gallon using gasoline.

The illustration below gives us an idea of how the energy in different explosives compare to the energy in gasoline. B.T.U. (which by the way, doesn't stand for Bent and Twisted Universals)— means British Thermal Unit. One B.T.U. is the amount of heat required to raise one pound of water one degree Fahrenheit.

Here's another swell illustration of the amount of energy in a gallon of gasoline. The General Motors Building in Detroit covers an entire city block. It weighs 460 million pounds, yet if all the energy contained in one gallon of gasoline could be converted into work, it would be enough to lift this entire building 2½ inches off the ground.

Hmmm—we see what the Professor means and so we're going to swear off smoking around vehicles and gas tanks. How about you?

Speaking of gas tanks—what about repairing them? This is a hazardous job and unless special precautions are taken, you may find yourself toting around a Gaff Hook in Hades.

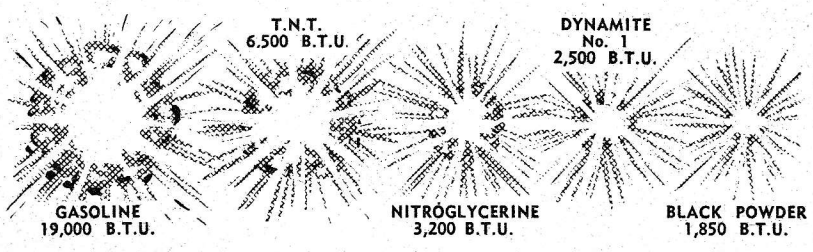
The first thing to consider, before attempting a repair, is to get rid of all the gasoline fumes in the tank. This can be done by filling the tank with water and agitating it by shaking and revolving. This operation must be thorough so that the water will absorb all of the gasoline.

Next dry the inside of the tank with compressed air using a rubber hose as a nozzle. The reason rubber is used, it eliminates the possibility of a spark caused by a metal nozzle striking the tank. When dried thoroughly, again fill with water to the point requiring repair, being sure that the tank has an opening for proper ventilation.

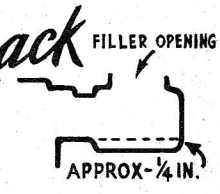
The tank can then be soldered or welded without any danger of blowing you and your equipment through the roof.

In some shops where a Kerrick cleaner is available, the cleaning operation can be done by using hot water and steam instead of plain water. When using this method of cleaning, turn the soap control top off and only use the steam and hot water. After the tank has been thoroughly hosed out it should be dried with compressed air as in the other method and then partly filled with water before any welding or soldering is done.

The whole thing boils down to the fact that **caution** is darn good **life insurance.**



Half-track Trick



Sometimes things aren't what they seem to be on a Half-track.

Take the case of Pte. C. P. Emmess who was found crawling in circles in a local swamp in a state of hysterical dementia. Brought back to camp and given a full glass of Worchestershire sauce, he recovered sufficiently for the Sarge to get the story.

Seems his Halftrack had been overheating lately. He'd checked the vehicle from stem to gudgeon without finding a cause. Timing OK, oil level OK, fan belt OK, radiator O . . . . . hold it!—could it be? Leading the dazed Emmess over to the vehicle the Sarge unscrewed the rad filler cap. Poking a finger inside he withdrew it and with one quick look had the trouble spotted.

"There's not enough water in the rad" murmurs the Sarge.

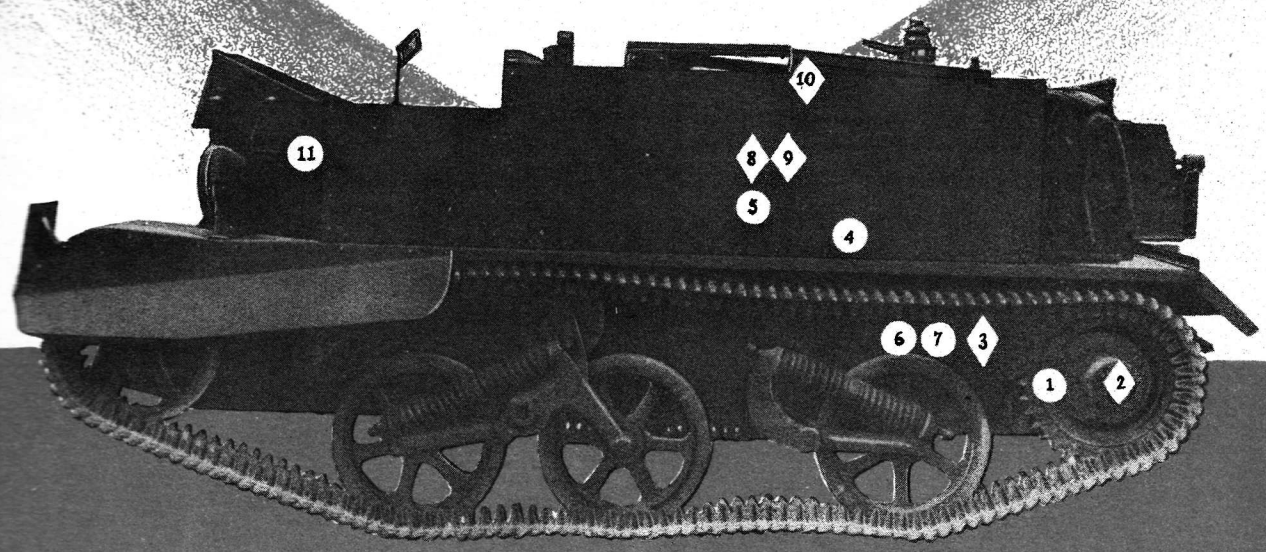
"But I checked it tonight," screamed Emmess "You can **see** it right up in the filler neck—lookit your finger Sarge, its wet ain't it?"

"Yeh, I know" says the Sarge, "You looked in the filler hole, saw water and being a straight forward sort of guy, figgered the rad was full. But thats where these particular rads fool ya! There's a depression in the bottom of the filler neck—the water just sits there making like the rad was full and happy even when it isn't. See my finger? It's wet for just about 1/4" —that's about the depth of the depression. Now what you've gotta do is make sure the water is more than 1/2" deep in there. Until it **is,** your rad isn't full. Bet you haven't added water to this rad for a week."

"Gimme another glass of that "Wooster"' sauce," muttered Emmess —"quick!"

HOW'S YOUR CARRIER...PIGEON?

If you're on the beam your Universal Carrier will already have all these modifications. If you're in doubt—here's a chance to check them.



1. Brake adjuster housing plug button.
   Mod. Bulletin D-1.
   This plug stops seizure of brake adjuster plungers.

2. Wheel Bearing Wrench.
   Mod. Bulletin D-2.
   This wrench may be in the carrier tool kit—if it isn't don't get into a sweat 'til you've looked up the bulletin.

3. Coupling oil seal.
   Mod. Bulletin E-1.
   This prevents oil leakage at coupling gear box.

4. Engine Serial Number Location.
   Mod. Bulletin F-1.
   You should be able to identify the block when the engines out of the vehicle.

5. Oil pressure gauge engine unit.
   Mod. Bulletin F-2.
   Electric oil pressure gauge replaces the liquid type gauge.

6. Transmission Gear Shifter Fork-Reverse.
   Mod. Bulletin H-1.
   Makes shifting into reverse easier.

7. Transmission Countershaft Gear Thrust Washers.
   Mod. Bulletin H-2.
   Prevents excessive wear on countershaft thrust bosses.

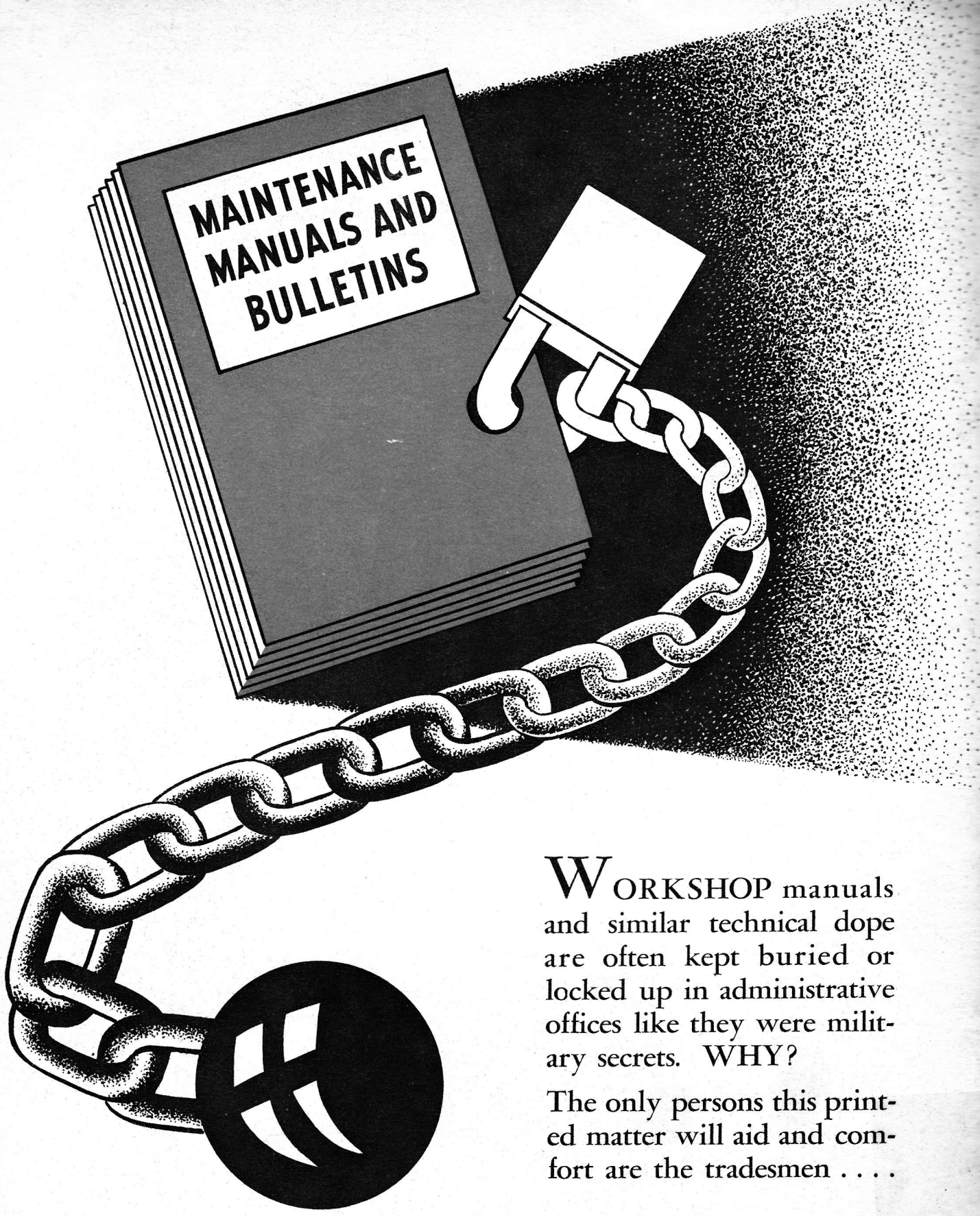
8. Oil bath air cleaner elbow felt seal.
   Mod. Bulletin J-1.
   A wider felt, (7/16" wide instead of 5/16") does a better job of keeping out dust.

9. Oil bath air cleaner.
   Mod. Bulletin J-2.
   Oil bath air cleaners are now a "must have" on carriers.

10. Installation of 2" Mortar Mounting.
    Mod. Bulletin L-1.
    This bulletin just tells you how-to mount them—if you haven't got a 2" mortar to install don't worry about it.

11. Sighting Vane-Universal Carrier.
    Mod. Bulletin M-1.
    If your carrier hasn't got a sighting vane—it should have.

◇ *OF SPECIAL INTEREST TO UNIT GARAGES.*



WORKSHOP manuals and similar technical dope are often kept buried or locked up in administrative offices like they were military secrets. WHY?

The only persons this printed matter will aid and comfort are the tradesmen . . . .

Give 'em to them as needs 'em!